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PROBLEMS.

52. Proposed by F. P. MATZ, M. Sc., Ph. D., Professor of Mathematics and Astronomy in New Windsor College, New Windsor, Maryland.

In how many ways can we arrange 12 friends of the MONTHLY, around a table, so that; (1), the editors may never be together, (2), Matz and Halsted may never be apart; and (3), Zerr and Ellwood may always have Gruber betwixt them?

53. Proposed by LEONARD E. DICKSON, M.A., Fellow in Mathematics, University of Chicago.

Can it be proven that the value of the expression

$$\left\{ 5x - \frac{5x+3}{3} \cdot \frac{5x(5x-1)}{1.2} + \frac{(5x+3)(5x+8)}{4.5} \cdot \frac{5x(5x-1)(5x-2)}{1.2.3} \right. \\ \left. - \frac{(5x+3)(5x+8)(5x+13)}{5.6.7} \right. \\ \frac{5x(5x-1)(5x-2)(5x-3)}{1.2.3.4} + \frac{(5x+3)\dots(5x+18)}{6.7.8.9} \cdot \frac{5x\dots(5x-4)}{1\dots5} + \dots \\ \left. + (-1)^{5x-2} \frac{(5x+3)\dots(30x-12)}{5x(5x+1)\dots(10x-3)} \cdot 5x + (-1)^{5x-1} \frac{(5x+3)\dots(30x-7)}{(5x+1)\dots(10x-1)} \right\}$$

is identically zero?

GEOMETRY.

Conducted by B.F.FINKEL, Kidder, Missouri. All contributions to this department should be sent to him.

SOLUTIONS OF PROBLEM.

42. Proposed by G. I. HOPKINS, Instructor in Mathematics and Physics in High School, Manchester, New Hampshire.

If the bisectors of two angles of a triangle are equal the triangle is isosceles.

II. Solution by G. B. M. ZERR, A. M., Principal of High School, Staunton, Virginia; H. C. WHITAKER, M. S., M. E., Professor of Mathematics. Manual Training School, Philadelphia, Pennsylvania; WILLIAM HOBBY, a Student in University of Tennessee, Knoxville, Tennessee.

Let $AC=b$. Then $AD=b \sin C / \sin (C+\frac{1}{2}A)$,

$CE=b \sin A / \sin (A+\frac{1}{2}C)$.

$\therefore \sin C \sin (A+\frac{1}{2}C) = \sin A \sin (C+\frac{1}{2}A)$.

Let $x = \sin \frac{1}{2}A$, $y = \sin \frac{1}{2}C$.

Then $(2xy - 2x^3y - y^2 + 2x^2y^2)\sqrt{1-y^2}$

$= (2xy - 2xy^3 - x^2 + 2x^2y^2)\sqrt{1-x^2}$.

$\therefore (x^2 - y^2, \{ x^2 + y^2 - x^4 - x^2y^2 - y^4 - 4xy$

$+ 4x^3y + 4xy^3 - 4x^3y^3 \} = 0$.

$\therefore x=y$ and $\angle A = \angle C$,

also, $(x-y)^4 - (x-y)^2 + xy(1-xy) + xy(1-2xy)^2 = 0$.

